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The Rise-fall and the Fall[1]

Nobuo Yuzawa

Keywords: Rise-fall, Fall, RF peak, F peak, tonic syllable, declination, duration

1. Introduction

'TONI' is the name of a web site created by Maidment in 2000 for the purpose of practicing recognition of English nuclear tones. It contains simple sentences with different locations and types of the tonic syllable. In the program, each sentence is given orthographically with the tonic syllable underlined. The learner is supposed to listen to each sentence and choose what he/she recognises as the right tone by clicking the corresponding icon on the computer screen. The correct answer is then given for checking. There are two sentences which particularly need highlighting:

- "I ˈthink it's about ^half past •three."
- "I ˈthink it's about half \past •three." [2]

The first sentence is spoken with the Rise-fall and includes three syllables in the tonic element[3], while the second is spoken with the Fall and includes two syllables in the element. When there are three syllables in the tonic element, and they are spoken with the Rise-fall, the most common type of F0 is low for the first syllable, high for the second, and low for the final. If the second and final syllables are focused on, the F0 contour is similar to the contour for the Fall (i.e. descending F0), just as in the second utterance, where the tonic syllable is located in 'past' – one syllable to the right from 'half'. The acoustic analysis of these two utterances is shown in Figure 1.

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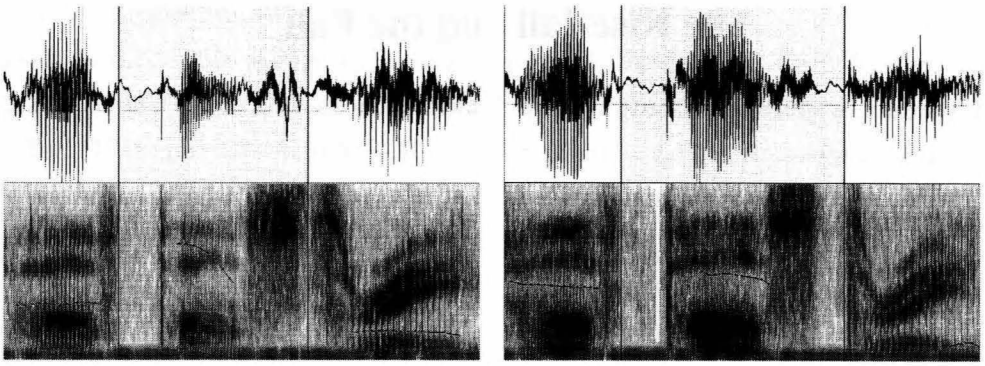
[1] This paper is based upon the author's oral presentation made at the Linguistic Society of Japan in November 2003.

[2] Only the tonic syllable, which is underlined here, is marked in the program. Marks for the high head (marked in 'ˈ') and a stressed syllable (marked in '•') are added based upon the author's perception. The symbols '^' and '\' indicate the Rise-fall and the Fall, respectively.

[3] The tonic element corresponds to syllables from the tonic syllable to the final syllable in the same tone-unit. When the tonic syllable is a single word followed by no syllable in the tail, the element is made up of one syllable.



(a) (b)

Figure 1 Panel (a) is the acoustic analysis of '^half past •three', and Panel (b) is of 'half \past •three'. Spectrogram and F0 are shown in the bottom half of each panel. The place delimited by the two vertical lines corresponds to 'past'. The F0 scale ranges from 50 to 250Hz.

As this figure shows, the F0 contour between the two utterances looks alike, with the low-high-low contour from the first (i.e. leftmost) syllable[4] to the third. The peak is located in the second syllable 'past' in both cases. Slight differences, however, are found in (1) peak height in the second syllables, (2) degree of descent in this syllable, and (3) height between the first syllable and the second. The peak is higher in Panel (a) than in Panel (b). In addition to this, in (a), the F0 contour jumps high from the first syllable (i.e. the tonic syllable) to the second, and falls rapidly in the second syllable, while in (b), there is not much difference in height between the first syllable and the second (i.e. the tonic), and the descent in the second syllable is slight.

In the British approach, these two utterances are clearly differentiated, but for the untrained ear, they may sound similar or even alike, due to a similarity of F0. This paper examines how these two kinds of utterances are acoustically different and whether features found in the two utterances are also applicable to similar pairs.

2. Data

The data for this research is read by a professional British phonetician, and consists of 14 pairs:

1a. (I) ^love it.

[4] This first syllable corresponds to the tonic syllable in Panel (a) and a syllable immediately before the tonic syllable in Panel (b).

1b. (I) love \it.[5]

2a. (Yes but) ^how •soon?

2b. (Yes but) how \soon?

3a. (I 'don't) ^blame you.

3b. (I 'don't) blame \you.

4a. ^Did he, •now?

4b. Did \he, •now?

5a. (I'm) ^sure I •can.

5b. (I'm) sure \I •can.

6a. (It's e'nough to 'make a) ^saint •angry.

6b. (It's e'nough to 'make a) saint \angry.

7a. ('Why not 'write and) ^warn him, •then?

7b. ('Why not 'write and) warn \him, •then?

8a. ('Is there 'really much) ^point in it?

8b. ('Is there 'really much) point \in it?

9a. ^Tell them you (•hate it). [5]

9b. Tell \them you (•hate it).

10a. (Who) ^else is there (to •do it)? [6]

10b. (Who) else \is there (to •do it)?

11a. (Oh) ^ought I, in(•deed)? [4]

11b. (Oh) ought \I, in(•deed)?

12a. (Well give) ^up the i(•dea). [4]

12b. (Well give) up \the i(•dea).

13a. ('Why don't you) ^do something (a•bout it)? [6]

13b. ('Why don't you) do \something (a•bout it)?

14a. ('Wouldn't) ^you be •happ(y)? [4]

14b. ('Wouldn't) you \be •happ(y)?

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[5] It may not be usual to put the tonic stress on the pronoun 'it', but for the purpose of comparison, this utterance is added to this data.

The number of syllables in the tonic element is different: two syllables in Nos. 1 to 3, three syllables in Nos. 4 to 8, and more than three syllables in Nos. 9 to 14. The number at the end of the utterance in Nos. 9 to 14 indicates the number of syllables in the tonic element.

It is confirmed in Yuzawa (2002) that segments in the tonic element influence the form of the Rise-fall. For example, a diphthong in the tonic syllable tends to attract the peak to this syllable. In other words, when there are two syllables in the tonic element, the Rise-fall may belong to the one-syllable type or the two-syllable type, in Kingdon's term (1958). Likewise, when there are three or more syllables in the element, this tone may belong to the one-syllable type, the two-syllable type, or the three-syllable type.

It is found by a preliminary analysis of the above data that when there are two syllables in the tonic element, all the utterances belong to the two-syllable type, and that all with three or more syllables in the element belong to the three-syllable type. Based upon this analysis, syllables irrelevant to this research are enclosed by parentheses in the list.

The procedure of this research is as follows: In the two-syllable type of the Rise-fall, two syllables in the tonic element are acoustically examined. In the three-syllable type, three syllables are chosen in the element[6], and are acoustically examined. Next, the same syllables in the other utterance (the Fall) of the same pair are acoustically examined in the same way. Finally, these two results are compared. Analysis is made pair by pair. Acoustic features for analysis include those of F0, duration and intensity. Comparison of duration is made relatively, by using the percentage scale. The F0 scale ranges from 50Hz to 250Hz. Two vertical lines are used to mark the second syllable in figures showing acoustic analysis with spectrogram. The figures are selected due to space available for this paper.

[6] In Nos. 9a to 14a, the first three syllables in the tonic element are chosen for comparison because they are the essential part of the Rise-fall.

Figure 2 summarises the way of comparison in this paper.

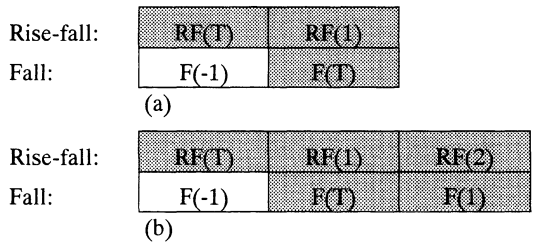


Figure 2 Panel (a) shows the two-syllable type of the Rise-fall and its corresponding type of the Fall. Panel (b) shows the three-syllable type of the Rise-fall and its corresponding type of the Fall.

In this research, the top row and the bottom row are compared both in (a) and in (b). Each cell indicates a syllable. The shaded cell corresponds to syllables in the tonic element. When there are more than three syllables in the tonic element, the three syllables in each row of (b) correspond to three essential syllables for the Rise-fall and the same syllables (i.e. one syllable immediately before the tonic syllable, the tonic syllable and one syllable immediately after the tonic syllable) for the Fall. T in parentheses means the tonic syllable, and the number indicates how much the syllable in question is apart from the tonic syllable. The minus symbol means the direction from the tonic syllable is to the left. RF(T) and F(-1) are simply called the first syllables, and RF(2) and F(1), the third syllables. The remaining four syllables are called the second syllables in this paper.

3. Two-syllable type

Intensity is compared between each pair, and its results are shown in Figure 3.

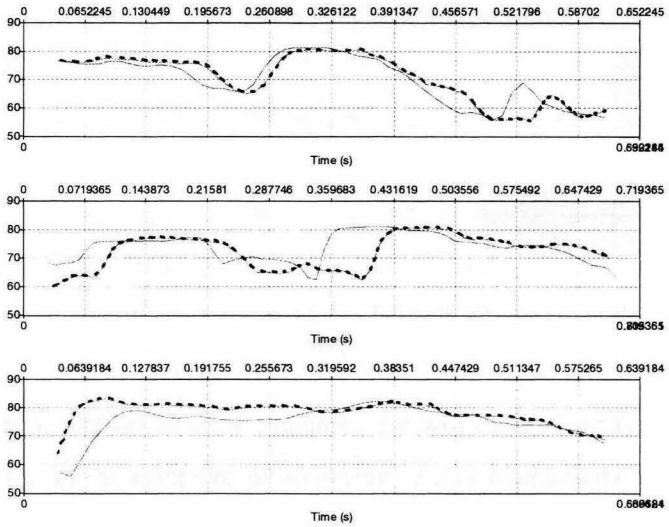


Figure 3 Intensity of the Rise-fall (straight) and the Fall (dotted) is displayed. The utterances are, from top to bottom, '^love it' vs. 'love \it', '^how soon' vs. 'how \soon', and '^blame you' vs. 'blame \you'.

No major difference in intensity between the Rise-fall and the Fall is detected, except for a slight difference in where the long flat valley is located in the second pair. This valley corresponds to /s/ in 'soon', which is pronounced longer with the Fall, probably due to the effect of the tonic syllable in this place.

Next, F0 and duration are examined in the three pairs. Duration of the second syllable is measured in relation to two syllables (i.e. RF(T) and RF(1) for the Rise-fall, and F(-1) and F(T) for the Fall).

['^love it' vs. 'love \it'] The peak of the Rise-fall (henceforth RF peak) and the peak of the Fall (henceforth F peak) are located on the second syllable, but they are located differently: the F peak is located more rightward than the RF peak (17.6% vs. 7.4%). The RP peak (162.6Hz) is considerably higher than the F peak (143.6Hz). The second syllable is spoken longer with the Fall (59.4%) than with the Rise-fall (54.1%). This is probably due to the effect of the tonic syllable spoken with the Fall.

['^how •soon' vs. 'how \soon'] The F peak is located more rightward than the RF peak in the second syllable (40.2% vs. 31.4%). There is also a noticeable difference in F0 for 'how'. When the utterance is spoken with the Rise-fall, it stays low in [a] of /aʊ/ but rises in [ʊ]. When it is spoken with the Fall, however, such a change is not detected. F0 simply descends slightly. There is also a noticeable difference in height between the

RF peak (185.2Hz) and the F peak (164.4Hz). In the case of duration, however, there is no major difference: 67.8% (Rise-fall) vs. 69.2% (Fall).

['^<u>blame</u> you' vs. 'blame \<u>you</u>'] The F peak is located more rightward than the RF peak in the second syllable (24.3% vs. 8.8%). The F0 contour for the first syllable, when the utterance is spoken with the Rise-fall, stays low and level in /eɪ/ and begins to rise in /m/, while with the Fall, it stays mid-level throughout the syllable. This is caused by the preceding word 'don't'. It functions as a high head and this height continues up to 'blame' in the case of the Fall. Such continuation, however, is not observed with the Rise-fall, where there is a step-down for the low onset of this tone. In the second syllable, the RF peak (173.7Hz) is much higher than the F peak (137.5Hz). The second syllable is spoken much longer with the Fall (59.0%) than with the Rise-fall (47.7%).

When a tonic syllable is spoken with the Fall, there is an initial rise from the onset to the F peak, but such a rise is not observed when a high head precedes the tonic syllable. This initial part is replaced by a gradual fall. In this case, the F peak is marked when there is a change in the direction of the fall, as shown by the arrow in Figure 4.

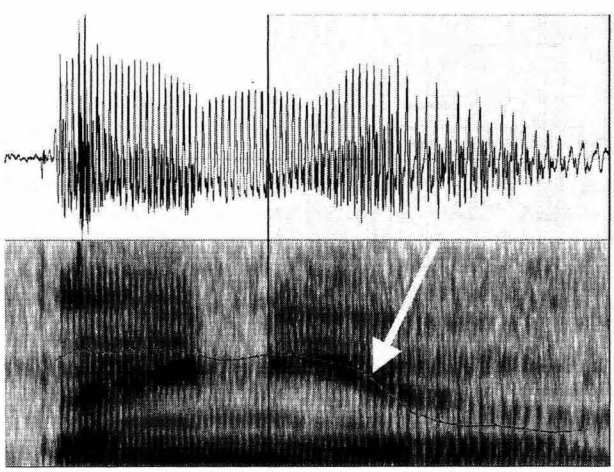


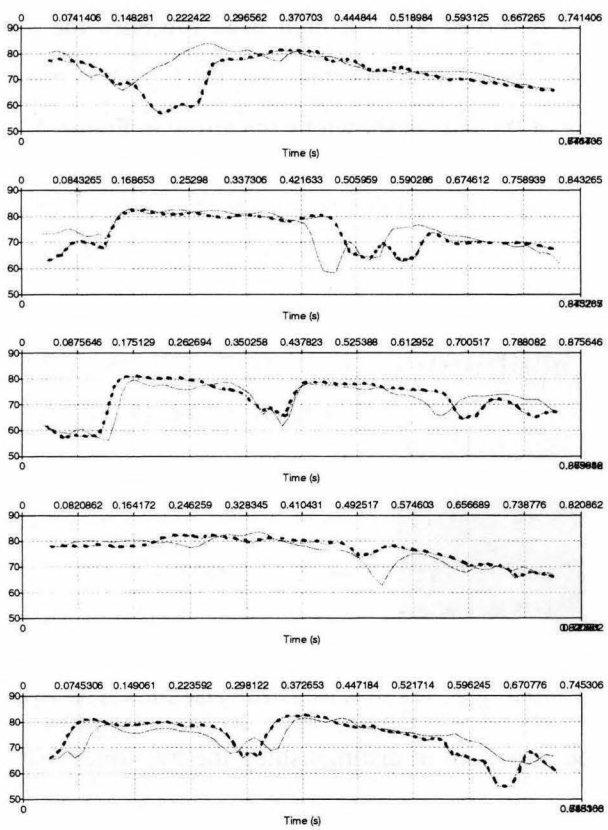
Figure 4 This shows the acoustic analysis of 'blame \<u>you</u>'. The point indicated by the arrow is the F peak.

In summary, intensity may not be important in distinguishing the two tones, but F0 and duration may play significant roles. The F peak is located more rightward than the RF peak in the second syllable, and the RF peak is higher than the F peak. Without a high head, F0 is low for the first syllable in both tones. When there is a high head,

however, there is a clear difference in F0 between the two tones. In the case of the Rise-fall, F0 descends suddenly immediately before the first syllable (i.e. RF(T)) for its essential low onset, but when the utterance is spoken with the Fall, no such abrupt descent is observed. The second syllable tends to be longer with the Fall than with the Rise-fall. A statistical analysis confirms the above results, except for one aspect. A significant difference is observed in peak height ($t = 2.51$, $df = 4$, $p = 0.066$) and peak location ($t = -3.02$, $df = 4$, $p = 0.039$), but not in duration of the second syllable ($t = -.83$, $df = 4$, $p = 0.451$).

4. Three-syllable type

The analysis results of intensity in the eleven pairs are shown in Figure 5.



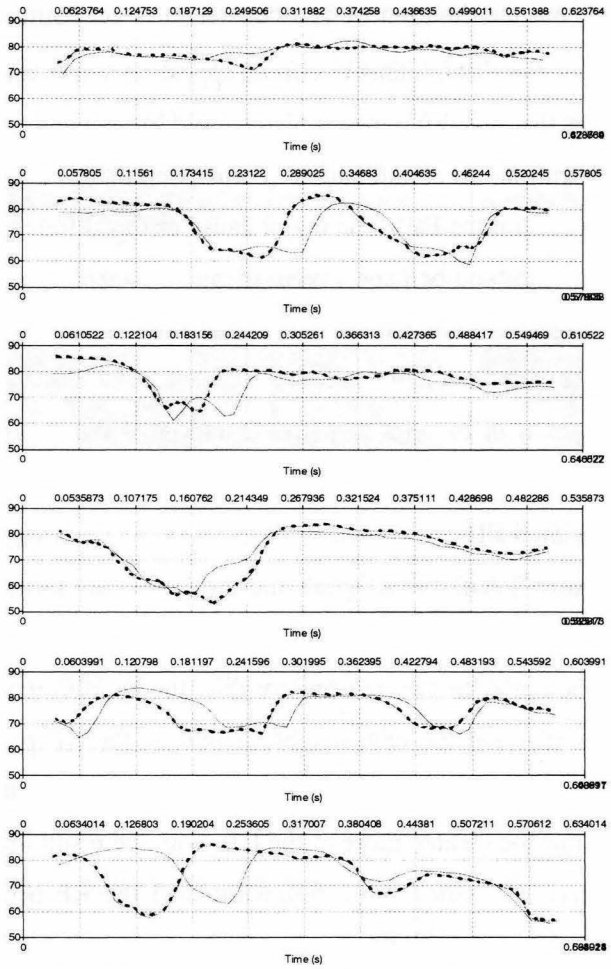


Figure 5 Intensity of the Rise-fall (straight) and the Fall (dotted) is displayed. The utterances are, from top to bottom, '^Did he, •now' vs. 'Did \he, •now', '^sure I •can' vs. 'sure \I •can', '^saint •angry' vs. 'saint \angry', '^warn him, •then' vs. 'warn \him, •then', '^point in it' vs. 'point \in it', '^Tell them you' vs. 'Tell \them you', '^else is there' vs. 'else \is there', '^ought I in' vs. 'ought \I in', '^up the i' and 'up \the i', '^do something' vs. 'do \something', and '^you be •happ' vs. 'you \be •happ'.

As in the two-syllable type, no particular difference is found in intensity between the two tones. There are some minor differences, but they are caused by different location of segments. In 'Did he, now', /h/ is much longer with the Fall, and where this consonant exists, the intensity scale is very low as shown by the flat valley. In 'sure I can', it is the different location of /k/ that triggers minor differences. In 'Tell them you', the valley with the Fall is caused by the long /ð/ in 'them'. In 'else is there', the longer flat valley with the Rise-fall is caused by the longer /s/ in 'else'. In 'ought I in', the longer flat valley with the Rise-fall is caused by the longer /t/ in 'ought'. In 'up the i', this

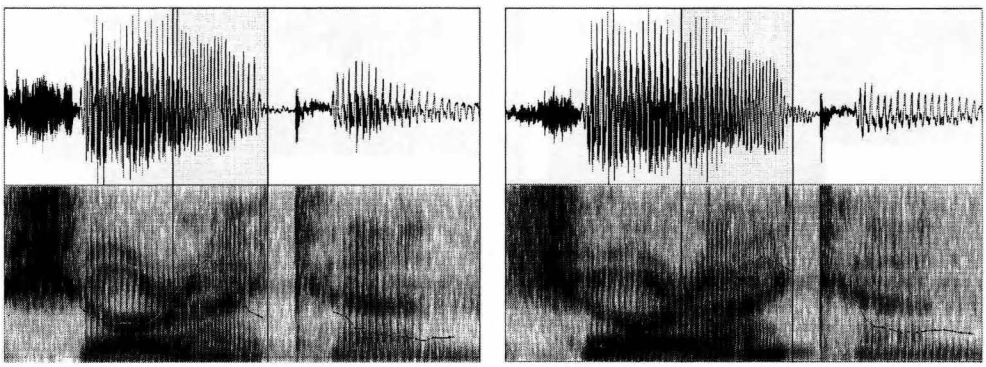
difference is detected in /ð/ in 'the', but the duration of this consonant is very similar between the two tones. In the last two pairs, the intensity curves appear very different, but a spectrographic analysis indicates that this difference is also caused by segments. In 'do something', 'do' is much longer with the Rise-fall, and /s/ (corresponding to the flat valley) in 'something' is slightly longer with the Fall. The major cause of this difference lies in the location of the tonic syllable. In 'you be happ', 'you' is much longer with the Rise-fall, and /b/ in 'be' is slightly longer with the Fall, for the same reason as the above pair. Influence of segments cannot be overlooked in intensity.

Next, F0 and duration are compared in the eleven pairs. Duration of the second syllable is measured in relation to three syllables (i.e. RF(T), RF(1) and RF(2) for the Rise-fall, and F(-1), F(T) and F(1) for the Fall).

['^Did he, •now' vs. 'Did \he, •now'] Both the RF peak and the F peak are located on the second syllable, but, unlike the other pairs, the former is located more rightward than the latter (85.2% vs. 77.5%). There may be two reasons for this: the big difference in duration (155ms (RF) vs. 247ms (F)) and the considerable height of the RF peak (216.8Hz). If, in the case of the Rise-fall, the second syllable is spoken longer and the peak is located lower, then the peak may be located more to the left, with the result that, as in the other pairs, the F peak may be located more rightward than the RF peak. Another interesting feature is that the F0 contour corresponding to /h/ of 'he' is missing in the case of the Fall. However, there is no such gap with the Rise-fall because 'he' is not the tonic syllable and is spoken in the weak form, with the result that /h/ is dropped. This fact is important for recognition of this utterance being spoken with the Rise-fall. There is also a noticeable difference in height between the RF peak (216.8Hz) and the F peak (167.8Hz). The second syllable is spoken much longer with the Fall (32.4%) than with the Rise-fall (22.3%).

['^sure I •can' vs. 'sure \I •can'] The F peak is located more rightward than the RF peak in the second syllable (74.1% vs. 36.4%). With the Rise-fall, the F0 contour stays low in [ʊ] of /ʊə/ but starts to rise in [ə], while with the Fall, it starts to rise at the boundary of 'sure' and 'I'. The F peak is slightly higher than the RF peak (164.9Hz

vs.166.9Hz). There is no noticeable difference in duration: 18.1% (Rise-fall) vs. 21.8% (Fall). The acoustic analysis is shown in Figure 6.

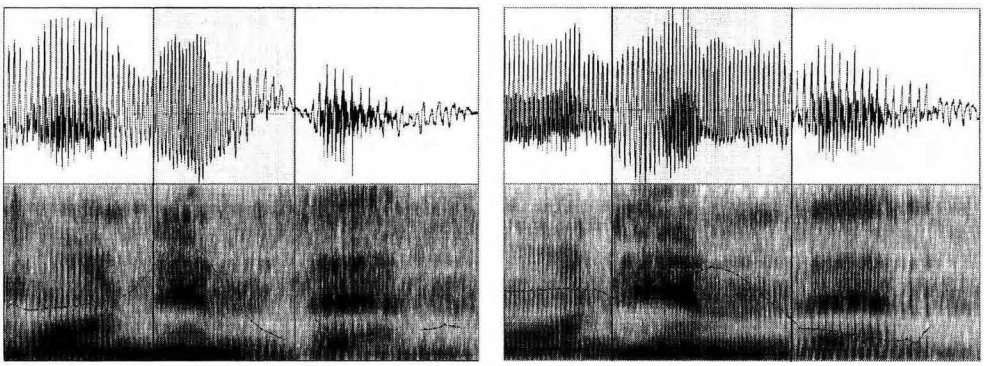


(a) (b)

Figure 6 Panel (a) is the acoustic analysis of '^sure I •can', and Panel (b) is of 'sure \I •can'.

['^saint •angry' vs. 'saint \angry'] The F peak is located more rightward than the RF point in the second syllable (52.8% vs. 10.3%). As in 'I don't blame you', there is no rise before the F peak due to a high head. Instead, a gradual descent called 'declination' is observed. There is also a noticeable difference in height between the RF peak (178.8Hz) and the F peak (113.0Hz). The second syllable /æŋ/ is spoken slightly longer with the Fall (29.5%) than with the Rise-fall (23.5%).

['^warn him, •then' vs. 'warn \him, •then'] The F peak is located more rightward than the RF peak in the second syllable (58.7% vs. 20.0%). A relatively sudden descent in F0 before the onset of the Rise-fall is observed in 'and', where /d/ is elided. In contrast, F0 is simply mid-level in /wɔ:/ of 'warn' with the Fall. It seems that when a high head precedes the tonic element, it is an abrupt descent of F0 for the Rise-fall and the mid-level F0 for the Fall that can be an important criterion to distinguish the two tones. This would imply that it is possible to predict which of the two tones comes before the onset of the first syllable (i.e. RF(T) and F(-1)). There is also a noticeable difference in height between the RF peak (182.8Hz) and the F peak (155.6Hz). The second syllable is spoken slightly longer with the Fall (37.2%) than with the Rise-fall (30.7%). Another noticeable difference is found in /h/ of 'him'. It is long and clear with the Fall, but is weak and almost dropped with the Rise-fall. The acoustic analysis is shown in Figure 7.



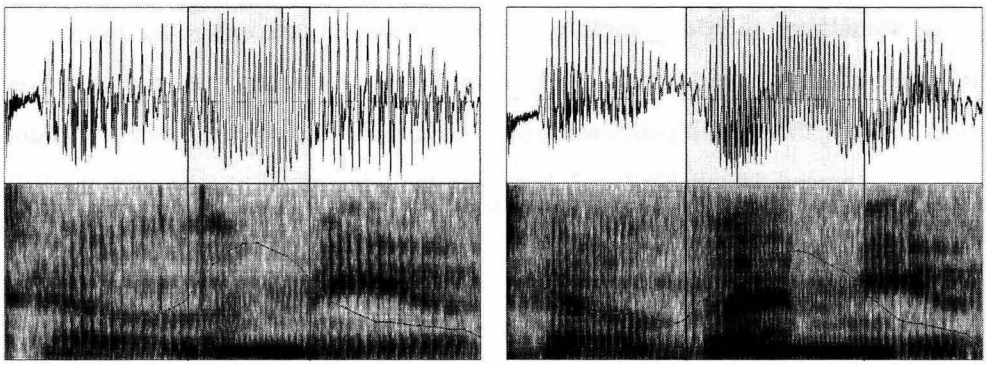
(a) (b)

Figure 7 Panel (a) is the acoustic analysis of '^warn him, •then', and Panel (b) is of 'warn \him, •then'.

[^point in it' vs. 'point \in it'] The F peak is located more rightward than the RF peak in the second syllable (57.1% vs. 35.3%). With the Rise-fall, the F0 contour stays low in /ɔɪ/ of 'point' but starts to rise slightly at /n/. This type of rise is frequently found in a post-vocalic sonorant after a long vowel or a diphthong when an utterance is spoken with the Rise-fall (Yuzawa 2000). On the other hand, with the Fall, such a rise is not detected, but declination is observed in 'point'. Because of a high head, there is a difference in height at the onset of this first syllable. With the Fall, the height achieved at the high head continues up to the first syllable (i.e. F(-1)) with a gradual fall before a jump at the second syllable (i.e. F(T)), but such a relatively unchanged contour is not observed with the Rise-fall, which requires a low pitch at the tonic syllable. There is also a noticeable difference in height between the RF peak (188.4Hz) and the F peak (142.7Hz). In the case of duration, however, there is no special difference: 13.8% (Rise-fall) vs. 17.4% (Fall).

['^Tell them you' vs. 'Tell \them you'] The F peak is located more rightward than the RF peak in the second syllable (66.7% vs. 54.3%). This may be due to a difference in F0 for 'tell'. With the Rise-fall, the F0 contour for this syllable starts to rise at /l/, but with the F, such a rise is detected near the end of it. There is also a difference in height between the RP peak (182.8Hz) and the F peak (172.4Hz). The second syllable is spoken longer with the Fall (36.7%) than with the Rise-fall (28.2%). Another major difference is also found in the vowel type in 'them'. With the Fall, it is pronounced as

the strong form, but with the Rise-fall, it is reduced to the schwa. The acoustic analysis is shown in Figure 8.



(a) (b)

Figure 8 Panel (a) is the acoustic analysis of '^Tell them you', and Panel (b) is of 'Tell \them you'.

['^else is there' vs. 'else \is there'] The F peak is located more rightward than the RF peak in the second syllable (51.4% vs. 25.7%). There is also a noticeable difference in height between the RF peak (204.4Hz) and the F peak (175.3Hz). There is no special difference in duration: 27.7% (Rise-fall) vs. 29.6% (Fall).

[^ought I in' vs. 'ought \I in'] The F peak is located more rightward than the RF peak in the second syllable (87.9% vs. 37.1%). This difference in location on the horizontal axis of the two peaks is highly related to where the rise starts. When the utterance is spoken with the Rise-fall, the rise begins at the end of /ɔː/ in 'ought'. When it is spoken with the Fall, however, the rise begins in [ɪ] of /aɪ/. The F0 contours at the second and third syllables are different. In the second syllable, the F0 contour is very high with the Rise-fall, while it is still low with the Fall. In the third syllable, it is already low with the Fall, but it is still high with the Fall. There is not a difference in height between the RF peak (200.6Hz) and the F peak (206.0Hz). Nor is there a noticeable difference in duration: 28.7% (Rise-fall) vs. 26.5% (Fall).

['^up the i' vs. 'up \the i'] The F peak is located slightly more rightward than the RF peak in the second syllable (85.3% vs. 75.9%). There is also a difference in height at the onset of the second syllable. The F0 contour is already high with the Rise-fall, but it is slightly lower with the Fall. There is only a minor difference in height between the RF

peak (174.7Hz) and the F peak (170.9Hz). There is no special difference in duration: 23.8% (Rise-fall) and 27.5% (Fall).

['^do something vs. 'do \something'] The F peak is located more rightward than the RF peak in the second syllable (98.1% vs. 78.8%). When the utterance is spoken with the Rise-fall, there is a big difference of 40.0Hz in F0 between the onset of 'do' and the end of the preceding syllable 'you', but when the utterance is spoken with the Fall, such a big change is not observed. When a high head precedes the tonic element, a step-down for the Rise-fall and the declination for the Fall are the two significant features to distinguish the two tones. The fact that the RF peak is located on /m/ in 'some' may also help to judge that this utterance is spoken with the Rise-fall. There is a noticeable difference in height between the RF peak (173.7Hz) and the F peak (163.4Hz). In the case of duration, however, there is no special difference: 41.8% (Rise-fall) and 43.0% (Fall).

['^you be •happ' vs. 'you \be •happ'] The F peak is located more rightward than the RF peak in the second syllable (62.5% vs. 55.2%). Because of a high head, the F0 contour in the first syllable is low with the Rise-fall but is high with the Fall. There is a noticeable difference in height between the RF peak (181.0Hz) and the F peak (164.9Hz). The second syllable is spoken much longer with the Fall (38.5%) than with the Rise-fall (23.9%).

In summary, like the two-syllable type, intensity may not be important in distinguishing the two tones, but F0 and duration may play significant roles. The F peak is almost always located more rightward than the RF peak in the second syllable, and the RF peak is almost always higher than the F peak. When there is no high head, F0 in the first syllable is basically low in both tones. When a high head precedes the tonic element, there is a clear difference in F0 between the two tones. A step-down or a sudden descent is the sign of the Rise-fall, while simple declination is a sign of the Fall. The second syllable tends to be longer with the Fall than with the Rise-fall. It is also found that the qualitative difference in segment is also important in the distinction of the two tones. A statistical analysis confirms the above results. There is a significant difference in peak height ($t = 2.51$, $df = 20$, $p = 0.018$), peak location ($t = -2.63$, $df = 20$, $p = 0.016$), and duration of the second syllable ($t = -1.85$, $df = 20$, $p = 0.079$).

5. Concluding remarks

This paper examined differences in F0, intensity and duration between the Rise-fall and the Fall when the tonic syllable was located differently in the same sentences. The tonic syllable of the utterance spoken with the Fall is located by one syllable to the right, from the tonic syllable of the utterance spoken with the Rise-fall. These two types of utterances were used in this research to compare their acoustic differences. The data was classified into the two-syllable type and the three-syllable type. All the utterances with two syllables in the tonic element belonged to the two-syllable type, and all with three or more syllables in the element belonged to the three-syllable type. Major findings, irrespective of these types, are as follows:

Intensity seems to be unimportant in differentiating the two tones, but F0 and duration play significant roles, with F0 being more important. The F peak tends to be located more rightward than the RF peak in the second syllable. The RF peak tends to be located higher than the F peak. The second syllable tends to be spoken longer with the Fall than with the Rise-fall, in relation to syllables relevant in this research. A high head influences F0 greatly. Without it, F0 is basically low for the first syllable in both tones. With it, however, there is a clear difference between the two tones. When the utterance is spoken with the Rise-fall, F0 descends relatively suddenly before the first syllable (i.e. RF(T)) to get ready for the low onset of this tone, but when it is spoken with the Fall, there is no such abrupt descent. Instead, a slight and smooth descent is observed in this place. Owing to this difference, it may be possible to predict which of the two tones is used before the first syllable (i.e. RF(T) and F(-1)) is uttered. The quantitative and/or qualitative difference in segments such as /h/ in the second syllable is also important in distinguishing the two tones. They are pronounced longer and more clearly with the Fall.

The major findings are also applicable to the two utterances mentioned in the introduction. The F peak is located more rightward than the RF peak in the second syllable (63.8% vs. 34.5%). The RF peak (181Hz) is located higher than the F peak (137Hz). The second syllable is longer with the Rise-Fall than with the Fall (46.5% vs. 40.0%). It was also stated in this section that there is a difference between the two tones in terms of height from the first syllable to the second, and it was confirmed that this is

because of the presence of a high head. This pair is structurally identical with Nos. 6, 7 and 8. One noticeable difference between these two kinds of pairs is the descent of F0 is almost level in the case of the utterance spoken with the Fall cited in the introduction. This is probably due to two obstruents in the coda of the second syllable 'past'. They make F0 corresponding to these segments disappear. If these segments are sonorants, descending F0 can clearly be observed.

Although pairs of the Rise-fall and the Fall examined here may be auditorily similar, especially to the untrained ear, because the F0 peak is located in the same syllable, it was clearly demonstrated in this paper that the pairs can be distinctly differentiated acoustically, as the British approach claims. As part of future work, it may be necessary to check the results with more utterances, especially those belonging to the two-syllable type.

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上昇下降調と下降調

湯澤伸夫

本論文では，英語の上昇下降調と，同音調の音調核が 1 音節右側に移動した下降調の音響分析をした。F0 頂点部が同じ音節にあるため，知覚上の差が少ないと感じられるが，分析の結果，F0 頂点部の水平位置と第 2 音節の持続時間に顕著な違いがあり，統計的にも別種と位置付けられることが分かった。また，高頭部の存在により F0 に明確な違いが生じるため，第 1 音節前の F0 の動きから，どちらの音調になるかが予測可能であることも分かった。

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